

CLAIMS

1. A method of annealing a wafer, comprising:
applying a basic thermal budget to a weakened zone of a wafer substantially evenly over the weakened zone, the basic thermal budget being insufficient to detach a detachment layer from a remainder of the wafer at the weakened zone; and
applying an additional thermal budget locally in an initiation region of the weakened zone in which the basic thermal budget is applied for initiating detachment of the detachment layer at the weakened zone.
2. The method of claim 1, wherein the weakened portion extends through a crystalline layer of the wafer.
3. The method of claim 2, wherein the wafer comprises a semiconductor material.
4. The method of claim 1, wherein a plurality of heating elements are operated to provide different amounts of heat to substantially evenly apply the basic thermal budget.
5. The method of claim 4, wherein the basic thermal budget is applied to the wafer in a substantially vertical orientation.
6. The method of claim 4, wherein the basic thermal budget is applied to the wafer in a substantially horizontal orientation.
7. The method of claim 1, wherein the basic thermal budget is applied before the application of the additional thermal budget.
8. The method of claim 1, wherein the basic and additional budgets are applied in a concurrent application.
9. The method of claim 8, wherein the wafer comprises a plurality of wafers to which the basic and additional thermal budgets are applied simultaneously.

10. The method of claim 1, further comprising flowing a heat conducting gas over the wafer and controlling the flow over a plurality of regions on the wafer for applying the even basic thermal budget.

11. The method of claim 10, wherein the flow of heat conducting gas is controlled by flowing the gas across a diffusion barrier damper to the wafer.

12. The method of claim 10, wherein the flow of heat conducting gas is controlled by flowing the gas across a perforated heating chamber damper to the wafer.

13. The method of claim 1, wherein the basic thermal budget is sufficiently high such that the application of the additional thermal budget causes the detachment to propagate through the weakened zone.

14. A wafer annealing device, comprising:
a positioner configured for holding a wafer that has a weakened zone configured for facilitating detachment of a detachment layer adjacent the weakened zone; and
a heating assembly configured for:
applying a basic thermal budget to a weakened zone of a wafer substantially evenly over the weakened zone, the basic thermal budget being insufficient to detach a detachment layer from a remainder of the wafer at the weakened zone, and
applying an additional thermal budget locally in an initiation region of the weakened zone in which the basic thermal budget is applied for initiating detachment of the detachment layer at the weakened zone.

15. The annealing device of claim 14, wherein the heating device comprises:
a plurality of heating elements disposed adjacent different portions of the wafer; and
a controller assembly operably associated with the heating elements for controlling the heating of different heating elements to produce different amounts of heat to substantially evenly apply the basic thermal budget.

16. The annealing device of claim 15, wherein the controller assembly is operably associated with the heating elements for independently controlling the different heating elements.

17. The annealing device of claim 15, wherein the heating assembly comprises:
a gas feed for flowing a heat conducting gas for transferring heat to the wafer;
and
a gas control assembly configured for controlling the distribution of the gas flow in association with the wafer.

18. The annealing device of claim 17, wherein the gas control assembly comprises a diffusion damper configured to cause the gas to flow in a predetermined configuration.

19. The annealing device of claim 18, wherein the diffusion damper comprises a perforated heating chamber in which the wafer is received for heating or a diffusion barrier.

20. The annealing device of claim 15, wherein the heating elements extend generally horizontally and are stacked in a generally vertical direction.

21. The annealing device of claim 20, wherein the positioner is configured for holding the wafer substantially vertically for heating.

22. The annealing device of claim 20, wherein the heating elements substantially surround the wafer held by the positioner.

23. The annealing device of claim 14, wherein the positioner is configured for holding the wafer substantially horizontally for heating.